The Avogadro Group, LLC

SOURCE TEST PLAN
2004 INITIAL EMISSION COMPLIANCE TESTS AND CEMS RATA
METCALF ENERGY CENTER
SAN JOSE, CALIFORNIA

Prepared For:

CALPINE CORPORATION

For Submittal To:

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
CALIFORNIA ENERGY COMMISSION
EPA REGION 9

Prepared By:

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SUMMARY INFORMATION

Source Information

Source Location:	Calpine Metcalf Energy Center 1 Blanchard Road San Jose, California 95013
Plant Contact:	Mr. Dana Petrin
Company:	Calpine
Telephone:	(408) 361-4953
Regulatory Agency:	Bay Area Air Quality Management District California Energy Commission
Units:	Two 1,924 MMBtu/hr Siemens Westinghouse 501FD2 gas turbine engines with heat recovery steam generators
Purpose:	Determination of compliance with permit conditions, RATA
Permit:	Authority to Construct, Plant No. 12183
Procedures:	EPA Methods 1, 2, 3A, 4, 201A/202, 10, 18, 19, 7E/ 20 and 25A; BAAQMD Method ST-1B; EPA TO-12 and TO-15; CARB 429 and 430; ASTM Method D-5504

Testing Company Information

Testing Firm:	The Avogadro Group, LLC 737 Arnold Drive, Suite D Martinez, California 94553	
Certification:	ARB Independent Tester	
Contact:	Mr. Kevin Crosby Project Manager	Mr. Erick Mirabella General Manager
Telephone:	(925) 680-0936	(925) 680-0935
Facsimile:	(925) 680-4416	(925) 680-4416
Test Date (s):	To be determined, Spring 2005	

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SECTION 1.0

INTRODUCTION

The Avogadro Group, LLC (Avogadro) has been contracted by Calpine Corporation (Calpine) to perform a series of source emission tests at the new Metcalf Energy Center to be operated by Calpine in San Jose, California. The tests will be conducted on two 1,924 MMBtu/hr gas turbine engines with heat recovery steam generators (HSRG).

This test plan includes descriptions of the testing procedures, descriptions of the facility and sampling locations, target test conditions, and the program schedule. Appendix A contains generic descriptions and diagrams of the test methods. Appendix B contains a summary of the quality assurance procedures used by Avogadro and our CARB certification for source testing. Appendix C contains copies of the applicable permit and Appendix D presents our Field Work Safety Plan. This test plan also serves as a test notification as required by the BAAQMD and the CEC.

The testing program will be performed to determine compliance with the emission limits of the Authority to Construct (ATC) for Plant 12183 issued by the Bay Area Air Quality Management District (BAAQMD). Some of the test runs will also provide a relative accuracy test audit (RATA) of the plant's continuous emission monitoring systems (CEMS).

Avogadro will perform emission tests to measure the following emission parameters:

- Part 60 and Part 75 Initial Certification Tests (O_2, CO, NO_X)
  - RATA on outlet analyzers
- Emission Compliance:
  - CO (ppm volume dry, ppm @ 15% O_2, lb/hr, lb/MMBtu)
  - NO_X (ppm volume dry, ppm @ 15% O_2, lb/hr, lb/MMBtu)
  - POC (ppm volume dry, ppm @ 15% O_2, lb/hr, lb/MMBtu)
  - NH_3 (ppm volume dry, ppm @ 15% O_2, lb/hr)
  - SO_2 (fuel sulfur gr/100scf, stack ppm volume dry and lb/hrMMBtu)
  - Filterable and Condensible PM_{10} (gr/dscf, gr/dscf @ 12% CO_2, lb/hr, lb/MMBtu,day)
  - Formaldehyde, (ppb volume dry, lb/hr, lb/MMBtu,day)
  - Benzene, (ppb volume dry, lb/hr, lb/MMBtu,day)
  - PAH, (ng/dscm, lb/hr, lb/MMBtu ,day)
  - O_2 and CO_2, (% volume dry)
  - Stack volumetric flow rate (dscfm) and moisture content (% volume)
  - Fuel analysis (sulfur content)
  - Startup/shutdown emissions (NO_X, CO, POC, methane and ethane)

SECTION 2.0

TESTING CONTRACTOR

The test program will be conducted by Avogadro. Analysis of some of the samples will be subcontracted to qualified analytical laboratories. The contact persons for the project will be:

• The Avogadro Group, LLC:	Kevin Crosby	(925) 680-4337
• The Avogadro Group, LLC:	Erick Mirabella	(925) 680-0935
• Calpine Corp.:	Mr. Dana Petrin	(408) 361-4953
• Zalco Laboratory, Inc.:	John Zalatel	(661) 395-0539
• Alta Analytical, Inc.:	Martha Maier	(916) 933-1640
• Air Toxics, Ltd.:	Kelly Buettner Nicole Salengo	(916) 985-1000 x1001 (916) 985-1000 x1035
• AAC Lab:	Sucha Parmar	(805) 650-1642

Avogadro is a recognized independent contractor that has been approved to conduct emission source testing on behalf of the California Air Resources Board (CARB), pursuant to Section 91200-21220, Title 17, of the California Code of Regulations. Avogadro is a full service source testing and combustion engineering consulting firm with extensive experience in air quality management and pollution control.

Avogadro will provide a professional source test team to conduct the testing as described in this test plan. The test team members assigned to this project are familiar with the testing of natural gas-fired turbines and have been selected based on specific experience and proficiency with the methods to be used. Table 1-1 lists the assigned key test program personnel. Some or all of the personnel listed will take part in the project.

TABLE 1-1
KEY TEST PROGRAM PERSONNEL
METCALF ENERGY CENTER

PERSONNEL	TITLE	ASSIGNMENT	EXPERIENCE
Kevin Crosby	Scientist III	Project Manager	28 years
Erick Mirabella	Scientist IV	Quality Assurance	13 years
Dan Duncan	Engineer III	Project Chemist	17 years
Andy Berg	Scientist II	Project Management Support	6 years

Mr. Kevin Crosby will be project manager for the air sampling activities at MEC. Mr. Crosby's responsibilities include overseeing the execution and planning of all air sampling efforts including testing, reporting and project coordination. His primary objective is to ensure that the results generated by this test program will meet the expectations and requirements of both the regulatory agencies and Calpine. Since the test schedule warrants the use of two test teams at once, Andy Berg will manage, under Kevin's direction, some of the on-site activities for this project.

Mr. Erick Mirabella has been appointed as the Quality Assurance Officer for the project. He will review and validate the test results, lab analyses, and the final report. A summary of our standard QA/QC program is presented in Section 5.0.

Mr. Dan Duncan has been appointed as the project chemist. Mr. Duncan's responsibilities include management of the laboratory and sample glassware preparation and sample custody. He will ensure that the proper paperwork and samples reach the laboratory, and that both the field and laboratory efforts are in compliance with the EPA and CARB approved procedures.

The on-site activities will also include technicians and other support personnel chosen based on specific experience of the methods to be used throughout the program and schedule availability. Our website at www.avogadrogroup.com provides additional information on our company and personnel assigned to this project.

SECTION 3.0

SOURCE LOCATION INFORMATION

3.1 FACILITY DESCRIPTION

The MEC facility is located at 1 Blanchard Road just off Monterey Highway in San Jose, California. The facility includes two 1,924 MMBtu/hr Siemens Westinghouse 501FD2 gas turbine engines, each with a heat recovery steam generator (HSRG) with duct burners rated at 200 MMBtu/hr. Each unit operates in combined cycle mode and is equipped with selective catalytic reduction (SCR) systems for emissions control. Steam produced by the two HRSG's is used to operate a steam turbine generator. There are two dry extractive continuous emissions monitoring systems (CEMS), one to measure O_2, CO and NO_X emissions at the stack of each unit. O_2 and NO_X concentrations are also measured at the SCR inlet to provide process data.

3.2 SAMPLING LOCATIONS

Samples will be collected at the exhaust stacks, from sampling ports that meet EPA and CARB Method 1 criteria. The identical stacks are vertical, cylindrical ducts, with port access provided by ladders to permanent platforms that are approximately 120 feet above the ground. There are four usable sampling ports, located 90° apart from one another and are installed at least two stack diameters downstream from the nearest flow disturbance and at least 0.5 diameters upstream from the stack exit.

The stack diameter and configuration measurements will be verified by Avogadro personnel prior to testing. Additional information including traverse point locations will be included in the final report. The traverse points will be located according to the applicable reference methods.

SECTION 4.0

TEST DESCRIPTION

4.1 PROGRAM OBJECTIVES

The testing program will be conducted to address the conditions of the ATC permit granted by the BAAQMD. The permit conditions that require testing are listed below; the numbering of the conditions is consistent with the revised permit application that is pending as of the writing of this test plan.

Condition 12 – Test ***both*** Gas Turbine/HRSGunits during **startup and shutdown** (a total of three startups and three shutdowns between the two units) to determine compliance with Condition 21. The tests will measure emissions of:

- NO_X, CO (also concentrations of O_2 and CO_2)
- Precursor Organic Compounds (POC), Methane and Ethane

Condition 32 – Test ***both*** Gas Turbine/HRSG units at **maximum** and at **minimum** load to determine compliance with Condition 20 e. The tests will provide data for correlation of operating parameters with ammonia emissions:

- NH_3 (correlation with fuel heat input and NH_3 injection rate)

Condition 33 – Test ***both*** Gas Turbine/HRSG units at **maximum** load to determine compliance with Condition 20 a, b, c, d, f, g and h. The tests will measure emissions of:

- NO_X, CO (also concentrations of O_2 and CO_2)
- POC, Methane and Ethane
- SO_2
- Particulate Matter (PM_{10} and CPM), stack gas flow rate and water content
- Relative Accuracy of the CEMS (NO_X, CO, O_2)

Condition 33– Test ***both*** Gas Turbine/HRSG units at **minimum** load to determine compliance with Condition 20 c and d. The tests will measure emissions of:

- CO (also concentrations of O_2 and CO_2, stack gas flow rate and water content)

Condition 35– Test ***one*** Gas Turbine/HRSG units at **maximum** and at **minimum** load to determine compliance with Condition 26. The tests will measure emissions of:

- Formaldehyde
- Benzene
- Specified Polycyclic Aromatic Hydrocarbon (PAH) compounds

The results of the emission tests will be presented in four reports, one to address each of the four conditions listed above. The reports will compare the results to the applicable permit limits and CEMS performance specifications. The results will be presented in units consistent with those reported by the CEMS and those listed in the permit. The permit limits are presented in Table 4-1 and will also be utilized as the "applicable standards" for alternate pass / fail criteria in reporting 40 CFR, Part 60 RATA results. The applicable performance specifications for the RATA are presented in Table 4-2.

4.2 TEST CONDITIONS

The compliance tests will be conducted while the turbines are operating at several load conditions to include the following:

- Start-up and shut-down
- Maximum load with duct burners and power augmentation steam injection
- Minimum load without duct burners and power augmentation

If additional RATA runs are needed, the turbine units will be operated at base load. Test conditions will be established on site by Calpine personnel.

TABLE 4-1
SUMMARY OF EMISSION PERMIT LIMITATIONS
INITIAL COMPLIANCE TESTS
METCALF ENERGY CENTER

Emission Parameter	Units of Measurement	Permit Limits	ATC Reference
Oxides of Nitrogen (NO_X)	ppm @ 15% O_2	2.5	Condition 20(b)[1]
	lb/hr as NO_2	19.2	Condition 20(a)
	lb/MMBtu as NO_2	0.00904	Condition 20(a)
	lb/startup as NO_2	480	Condition 21
	lb/shutdown as NO_2	80	Condition 21
Carbon Monoxide (CO)	ppm @ 15% O_2	6.0	Condition 20(d)[2]
	lb/hr	28.07	Condition 20(c)[2]
	lb/MMBtu	0.0132	Condition 20(c)[2]
	lb/startup	5028	Condition 21
	lb/shutdown	902	Condition 21
Precursor Organic Compounds (POC)	lb/hr as CH_4	2.7	Condition 20(f)
	lb/MMBtu as CH_4	0.00126	Condition 20(f)
	lb/startup as CH_4	48	Condition 21
	lb/shutdown as CH_4	16	Condition 21
Sulfur Dioxide (SO_2)	lb/hr as SO_2	1.28	Condition 20(g)
	lb/MMBtu as SO_2	0.0006	Condition 20(g)
Particulate Matter (total PM as PM_{10})	lb/hr without duct burners	9	Condition 20(h)
	lbMMBtu without duct burners	0.00452	Condition 20(h)
	lb/hr with duct burners	12	Condition 20(h)
	lbMMBtu with duct burners	0.00565	Condition 20(h)
Ammonia (NH_3)	ppm @ 15% O_2	5	Condition 20(e)[2]
Formaldehyde	lb/year (both units together)	3,796	Condition 26
Benzene	lb/year (both units together)	480	Condition 26
Specified PAH**	lb/year (both units together)	22.8	Condition 26

1 Averaged over any one-hour period.
2 Based on any 3-hour rolling average.
** As defined by the BAAQMD.

TABLE 4-2
SUMMARY OF PERFORMANCE SPECIFICATIONS
CEMS AND CERMS CERTIFICATION
METCALF ENERGY CENTER

Parameter	Performance Specification 40 CFR, Part 60 Appendix B	Performance Specification 40 CFR, Part 75 Appendix A	Specification Limit
O_2 Analyzer			
% volume dry	3, Section 13.2	Section 3.3.3	a / h
NO_X Analyzer			
ppm @ 15% O_2	2, Section 13.2	--	b or c
lb/hr as NO_2	2/6, Section 13.2	--	d
lb/MMBtu as NO_2	2/6, Section 13.2	Section 3.3.2	d / h or i
CO Analyzer			
ppm @ 15% O_2	4A, Section 13.2	--	e, f, or g
lb/hr	4A/6, Section 13.2	--	d
lb/MMBtu	4A/6, Section 13.2	--	d

<u>40 CFR, Part 60</u>

[a] No greater than 1% O_2 (based on actual analyzer readings).

[b] No greater than 20% of the RM value (if average emissions are above 50% of the emission standard).

[c] No greater than 10% of the applicable standard (if average emissions are less than 50% of the emission standard).

[d] No greater than 20% of the RM value or 10% of the applicable standard, whichever is greater (CERMS only).

[e] No greater than 10% of the RM value.

[f] No greater than 5% of the applicable standard.

[g] Within 5 ppm of the absolute difference between the RM and CEMS.

<u>40 CFR, Part 75</u>

[h] No greater than 10% of the RM (or 7.5% for annual RATA incentive).

[i] No greater than 0.020 lb/MMBtu (or 0.015 lb/MMBtu for annual RATA incentive) of the RM mean value if the 10% of RM criteria is not met (for use when analyzer emission rate is no greater than 0.200 lb/MMBtu).

4.3 TEST PROGRAM SCHEDULE

The test program will be completed in a single mobilization. Both units are scheduled to be tested concurrently by using two mobile CEM labs and two separate test teams. The schedule is presented in Tables 4-3 and 4-4. Since the operation schedule of a new power plant can be unpredictable at times, Avogadro reserves the right to modify the testing sequence while on site.

The PM_{10} runs will each be three hours in duration, and the PAH and Formaldehyde runs will each be four hours in duration. The other shorter-duration tests will be conducted during those longer test runs, so there will be several test runs in operation at the same time. The RATA test runs will be used to determine compliance as well as to calculate the CEMS relative accuracy.

TABLE 4-3
PROPOSED TESTING SCHEDULE
METCALF ENERGY CENTER UNIT 1 (TEST TEAM 1)

Date	Activity / Parameter	Test Run	Run Duration
April 22, 2005	Mobilize to MEC, set-up equipment	--	--
April 25 0800-1200	Initial Stack Measurements Analyzer Calibrations	-- --	-- --
April 25 1200-1800 concurrent	Max Load PM_{10}, SO_X Maximum Load Toxics RATA, NO_X, CO, O_2 POC, NH_3 Fuel Sulfur	#1 #1 #1, 2, 3, 4 #1 #1	180 min. 240 min. 21 min. each 30 min. grab sample
April 26 0700-1900 concurrent	Max Load PM_{10}, SO_X Maximum Load Toxics RATA, NO_X, CO, O_2 POC, NH_3 Fuel Sulfur	#2, 3 #2, 3 #5 to 12 #2, 3 #2, 3	180 min. each 240 min. each 21 min. each 30 min. each grab samples
April 27 0800-1900 concurrent	Minimum Load Toxics Minimum Load POC, CO, NH_3	#1, 2 #1, 2	240 min. each 30 min. each
April 28 0800-1300 concurrent	Minimum Load Toxics Minimum Load POC, CO, NH_3	#3 #3	240 min. 30 min.
April 29	Contingency Day	--	--

Note: A second test team will perform the tests on Unit 2. See Table 4-4.

TABLE 4-4
PROPOSED COMPLIANCE TESTING SCHEDULE
METCALF ENERGY CENTER UNIT 2 (TEST TEAM 2)

Date	Activity / Parameter	Test Run	Run Duration
April 22, 2005	Mobilize to MEC, set-up equipment	--	--
April 25 0800-1000	Initial Stack Measurements Analyzer Calibrations	-- --	-- --
April 25 1000-1700 concurrent	Max Load PM_{10}, SO_X RATA, NO_X, CO, O_2 POC, NH_3 Fuel Sulfur	#1 #1, 2, 3, 4 #1 #1	180 min. 21 min. each 30 min. grab sample
April 26 0800-1600 concurrent	Max Load PM_{10}, SO_X RATA, NO_X, CO, O_2 POC, NH_3 Fuel Sulfur	#2, 3 #5 to 12 #2, 3 #2, 3	180 min. each 21 min. each 30 min. each grab samples
April 27 0900-1200 1300-1400 1500-1600	 Startup POC, NO_X, CO Minimum Load POC, CO, NH_3 Shutdown POC, NO_X, CO	 #1 #1 #1	 ~3 hr. 30 min. ~1 hr.
April 28 0900-1200 1300-1400 1500-1600	 Startup POC, NO_X, CO Minimum Load POC, CO, NH_3 Shutdown POC, NO_X, CO	 #2 #2 #2	 ~3 hr. 30 min. ~1 hr.
April 29 0900-1200 1300-1400 1500-1600	 Startup POC, NO_X, CO Minimum Load POC, CO, NH_3 Shutdown POC, NO_X, CO	 #3 #3 #3	 ~3 hr. 30 min. ~1 hr.

Note: A second test team will perform the tests on Unit 1. See Table 4-3.

4.4 AVOGADRO TEST PROCEDURES

The test procedures to be used by Avogadro in this testing program are summarized in Table 4-5. Descriptions of standard procedures are included in Appendix A. Additional information on specific applications or modifications to standard procedures is presented in the following sub-sections. Where any conflicts exist in the descriptions, the specific descriptions here in Section 4.4 will take precedence.

TABLE 4-5
TEST PROCEDURES FOR EACH TURBINE
METCALF ENERGY CENTER

Parameter	Measurement Principle	Reference Method	Detection Limits
O_2	Paramagnetic	EPA 3A/20	< 2% of full scale
CO_2	Non-dispersive infrared	EPA 3A/20	< 2% of full scale
CO	Gas filter correlation	EPA 10	< 2% of full scale
NO_X	Chemiluminescence	EPA 7E/20	< 2% of full scale
POC (startup and shutdown)	Tedlar bag / GC or on-site direct GC[2] Flame ionization detection	EPA 18 EPA 18 [2] EPA 25A	< 0.3 ppm < 0.5 ppm < 1 ppm
POC (steady load)	Canister sample, lab pre-concentration and GC	EPA TO-12	0.01 ppm
SO_2	Calculated from fuel sulfur	ASTM D-3246	< 0.1 ppm
NH_3	Ion-selective electrode	BAAQMD ST-1B	< 0.5 ppm
PM_{10} with CPM	Gravimetric with condensible analysis	EPA 201A / 202	<0.0005 gr/dscf
Benzene	GC/MS	EPA TO-15	2.0 ppb
Formaldehyde	HPLC	CARB 430	0.5 *ug*/ml
Specified PAH[1]	HRGC/HRMS	CARB 429	0.02-0.20 *ng*/m^3
Volumetric flow	Stoichiometric calculation / pitot, temperature traverse	EPA 19 / EPA 1, 2	--
Moisture content	Impinger weight gain	EPA 4	--
Fuel analysis	Gas chromatography	ASTM D-1945	--

Note: CARB test methods for aldehydes and PAH have been proposed since the BAAQMD generally requires CARB methods for toxic measurements.

1 PAH compounds specified by the BAAQMD.

2 A direct-injection on-site GC will be used during startup and shutdown runs if it is available. This approach has been approved by EPA as an alternative procedure within EPA Method 18.

4.4.1 Gaseous Emissions

Concentrations of the gaseous constituents of the stack gas (CO, NO_X, O_2 and CO_2) will be measured using Avogadro's dry extractive continuous emissions monitor (CEM) system described in Appendix A. This system meets the requirements of EPA and CARB methods for gaseous species. A heated Teflon line and chilled knockout system will be used to prevent loss of NO_2 in the sampling system. The NO_X analyzer will be operated in the NO_X mode to measure NO plus NO_2. A molybdenum catalyst converter is used to convert NO_2 to NO for measurement of total NO_X.

The tests will be performed during several conditions according to the parameters in Tables 4-3 and 4-4. A preliminary traverse will be conducted from at least 12 traverse points to determine the stratification of the stack gases. The results will be used in selection of the traverse points to be used for the subsequent emission test runs. In the event that the stack gas concentrations differ by no more that 10% from the average value, three representative sampling points will be located according to 40CFR75, Appendix A to be used for the remaining tests.

The sample conditioning and delivery system includes components to extract a representative sample from the source, remove the moisture and particulate matter from the sample stream, and transport the sample to the analyzers. The primary components of this subsystem are:

1) A quartz, titanium, stainless steel or glass probe - heated or insulated as necessary to avoid condensation,
2) Sample filtration – filters located on the probe, pump, and prior to all of the analyzers for removal of particulate matter,
3) Teflon tubing - connecting the probe to the sample conditioner and the sample conditioner to the analyzer manifold - heated or insulated as necessary to avoid condensation,
4) Sample conditioner - glass or stainless steel flasks immersed in an ice bath to remove the moisture from the sample gas stream,
5) Vacuum pump - a leak-free pump with Teflon diaphragm to transport the sample gas through the system,
6) Sample manifold - a distribution system, constructed of stainless steel and Teflon tubing, to direct sample gas to the analyzers, and
7) Sample flow rate control - a series of rotameters, vacuum gauges and pressure gauges connected to the manifold used to maintain the appropriate sample flow rates.

The calibration gas system utilizes only EPA Protocol gases to verify the operation, linearity, and range settings of the electronic analyzers. The sample gas system allows for the introduction of the protocol gases to the analyzers either directly through the manifold (calibration error check - performed once daily) or through the sampling system (system bias check - performed with each run).

The electronic analyzers are rack mounted and are maintained in the mobile lab. The data recording and acquisition system is based on a digital system known as STRATA. It includes software for controlling the collection of calibration and emission monitoring data, and hardware for connection of the analyzer outputs to the recording system. Test results can be provided in three forms; on-site printouts of the digitized data diskette recordings of the digitized data, and printouts of strip charts from the monitoring data. For this test program, printouts of the one-minute averages will be provided in the final report.

4.4.2 Relative Accuracy Test Audit and Bias Test

Each turbine unit has its own continuous emissions monitoring system (CEMS) and continuous emissions rate monitoring system (CERMS) measuring dry-basis outlet concentrations of O_2, CO and NO_X and inlet concentrations of NO_X. Only the outlet analyzers will be addressed during this program. At least nine 21-minute test runs will be performed to complete the RATA of each system as specified in 40 CFR, Part 60, Appendices B and F and 40 CFR, Part 75, Appendix A. Relative accuracy will be calculated in units of ppm @ 15% O_2, lb/hr and lb/MMBtu for both the CO and NO_X analyzers and % volume dry for the O_2 analyzers. The NO_X RATA run results will also be used to calculate the bias adjustment factor (BAF) for reporting under Part 75.

For each Reference Method (RM) determination, the flue gas will be sampled at a number of traverse points that will be determined prior to testing using EPA Method 1 procedures. The differences between the RM sample and the pollutant monitor's readings will be evaluated from a minimum of nine sets of paired monitor and RM test data. From these differences, the 95% confidence coefficient will be calculated, and the relative accuracy determined. Any tests not included in the calculations for the determination of relative accuracy (maximum of three) will still be included in the final test report.

The relative accuracy of the O_2 analyzer will be determined in accordance with 40 CFR, Part 75, Appendix A, Section 3.3.3. The O_2 RATA results are acceptable if relative accuracy does not exceed 10.0% (semiannual criteria). Alternately, results are acceptable if the mean difference of the O_2 monitors' measurements and the corresponding RM measurements are within ±1.0% O_2 (40 CFR, Part 60, Appendices B, Performance Specification 3). Under the incentive program, if the RATA results are ≤7.5% or if the mean difference does not exceed ±0.7% O_2, then the next RATA can be performed on an annual basis rather than semiannually.

The relative accuracy of the NO_X analyzer will be determined in accordance with 40 CFR, Part 75, Appendix A, Section 3.3.2. The NO_X RATA results are acceptable if relative accuracy does not exceed 10.0% (semiannual criteria). Alternatively, if during the RATA the average NO_x emission rate is less than or equal to 0.20 lb/MMBtu, the mean value of the NO_x CEMS must not exceed ±0.02 lb/MMBtu of the RM mean value. The alternative criteria will only be utilized if the 10% relative accuracy requirement is not achieved. Under the incentive program, if the RATA results are ≤7.5% then the next RATA can be performed on an annual basis rather than semiannually. Alternately, if the average NO_x emission rate is less than or equal to 0.20 lb/MMBtu, the mean difference must not exceed ±0.015 lb/MMBtu for annual pass/fail criteria.

In accordance with 40 CFR, Part 60, Appendix B, Performance Specification 2, NO_X relative accuracy test results (concentrations only) are acceptable if the NO_X relative accuracy does not exceed 20% of the mean value of the RM test data in terms of units of the emission standard (if the average RM results are above 50% of the applicable standard) or 10% of the applicable standard (if the average RM results are below 50% of the applicable standard).

In accordance with 40 CFR, Part 60, Appendix B, Performance Specification 4A, CO relative accuracy test results (concentrations only) are acceptable if the relative accuracy of the CEMS is no greater than 10% when the average RM value is used to calculate relative accuracy or 5% when the applicable emission standard is used to calculate relative accuracy. Alternately, the CO relative accuracy test results are acceptable when the relative accuracy is calculated to be less than 5 ppm as the absolute average difference between the RM and CEMS, plus the 2.5% confidence coefficient.

Since the CO and NO_X analyzers incorporate equipment for the determination and reporting of pollutant mass emission rates (lb/hr and lb/MMBtu), the systems are technically defined as CERMS. In accordance with 40 CFR, Part 60, Appendix B, Performance Specification 6, relative accuracy test results for mass emissions are acceptable if the RA of the CERMS is no greater than 20 percent of the mean value of the RM test data in terms of the units of the emission standard, or 10 percent of the applicable standard, whichever is greater.

4.4.3 Precursor Organic Compounds

Steady load conditions

Precursor organic compounds (POC) are defined in the ATC as "any compound of carbon, excluding methane, ethane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, carbonates and ammonium carbonate". For steady load conditions (i.e. compliance testing), the concentrations of POC will be measured using EPA Method 18. The sampling and analysis will be conducted according to EPA

Compendium Method TO-12 in order to provide low enough detection limits (note that the emission limits for POC equate to approximately 1 ppm).

Flue gas samples will be collected in specially-prepared evacuated stainless-steel (SUMMA) canisters filled to approximately 10-15 inches Hg absolute pressure with ultra-pure nitrogen or helium. The dilution gas will serve to mitigate the effects of the moisture in the sample. Sample gas will be drawn through a probe and connecting line of Teflon tubing through a calibrated flow controller into each canister. Triplicate samples will be taken for each operating condition. The samples will be analyzed by cryogenic pre-concentration and GC/FID.

Triplicate 60-minute sampling runs will be conducted on each unit during two operating conditions as specified in Table 4-4. Each test run will be performed at a flow rate of approximately 0.05 liters per minute at one atmosphere. After sample collection, the canister will be transported to the laboratory for cryogenic pre-concentration and flame ionization detection analysis as described in Method TO-12 within 14 calendar days. The expected detection limit is on the order of 10 ppb by volume.

Results will be reported as concentrations of non-methane non-ethane organic compounds as heptane (and will be converted to the basis "as methane"). The canisters will be prepared and analyzed by Air Toxics, Ltd. of Folsom, California. Some of the same samples will be analyzed for benzene according to EPA Method TO-15 (see the section on benzene).

Startup and shutdown conditions

POC concentrations during the startup and shutdown conditions will be measured by gas chromatographic analysis of sample gas, either (1) injected directly from a heated Teflon sample line into an on-site GC, or (2) collected in Tedlar bags for subsequent laboratory analysis. The direct-injection GC method will be conducted by Field-Portable Analytical (FPA) of Cameron Park, California as the first choice in test methods, as long as FPA is available when the test is scheduled. FPA has gained approval from EPA for their standard operating procedure as an alternate within the description of EPA Method 18. The detection limit for methane, ethane, and POC is expected to be < 0.5 ppm.

The Tedlar bag method is a modification of EPA Method 18, as no pre-survey samples will be taken. This method approach is justified, as the concentrations of non-methane non-ethane organic compounds are expected to be below 1 ppm most of the time during the startup and shutdown sequences. The method detection limit is expected to be 0.3 ppm.

Twelve Tedlar bags for each unit (nine during start-up and three during shut-down) will be filled with sample gas using a rigid displacement container. The sampling probe will be connected to the bag with Teflon tubing. The samples will be drawn over approximately a 20-minute period from a single point chosen from the O_2 traverse. The bags will be shipped to AtmAA, Inc. in Calabasas, California for GC/FID analysis of C_1 through C_5 hydrocarbons, and C_6 and above by column backflush. Analysis will take place within 72 hours from sampling.

The results will be used to determine compliance with the permit limits by using the average fuel flow, POC concentration and O_2 concentration to calculate the pounds of POC emitted during collection of each sample. The total emissions from these sequential samples will be added to calculate the total pounds of POC emitted during each startup or shutdown.

In addition, a flame ionization detector (FID) analyzer will be operated during the entire start-up / shut-down period to measure total hydrocarbons on a continuous basis. The data will be used to track the progress of the startup or shutdown sequence and to aid the analyst in determining when to end one bag sample and begin another. The sampling apparatus will include a stainless steel probe and heated Teflon line connected to the inlet port of the analyzer. The analyzer uses an internal sampling pump and a heated oven/analysis section that keeps the sample gas at a minimum of 180 degrees Celsius (356 °F). The heated line will be maintained at a minimum of 135 degrees Celsius (275 °F) during operation.

The FID analyzer will be calibrated with three different concentrations of EPA Protocol gases that contain mixtures of propane or methane in air. The calibrations and operation of the analyzer systems will be conducted according to EPA Method 25A. Results will be calculated and presented as methane equivalents.

4.4.4 Particulate Matter

The concentrations and emission rates of PM_{10} will be measured using a combination of EPA Methods 201A and 202. The measurements will include filterable and condensible particulate matter (CPM). The Method 201A samples will be handled as described in the Method. The Method 202 samples will also be handled as described in Method 202, including the post-test nitrogen purge. Test runs will be 180 minutes in duration in order to collect sufficient sample volume to provide detection limits low enough to determine compliance with the permit conditions.

The apparatus will include a stainless-steel sampling nozzle and PM_{10} cyclone apparatus attached to an in-stack stainless-steel filter holder with a glass-fiber filter. The filter holder will be mounted at the tip of the sampling probe, which will include a length of Teflon tubing to connect the filter holder to the impinger train. The impinger train will be connected to the control box, which contains the sampling pump and dry gas meter. The sampling rate and nozzle size will be chosen to allow isokinetic sampling at the calculated rate. Sampling times or "dwell times" will be calculated at each traverse point according to Method 201A.

The filterable "front-half" PM_{10} will be recovered from the sampling apparatus as described in EPA Method 201A. The sample will include the probe and nozzle wash, filter, and rinses from the front-half of the filter holder. The sample will be analyzed gravimetrically to determine the concentration of filterable PM_{10}.

The "back-half" contents will be recovered and analyzed for condensable PM_{10} as described in EPA Method 202. A separate sample container will be used to collect the impinger contents and rinses, sample line, and the back-half filter holder wash. Each sample will be extracted with dichloromethane in a separatory funnel. The analysis will include gravimetric measurement of the residue from the aqueous and organic fractions. The corrected results will be used to determine the concentration of condensable particulate matter.

4.4.5 Ammonia Slip

Concentrations of ammonia will be determined using Bay Area AQMD Method ST-1B. Triplicate 60-minute test runs will be performed during each operating condition as specified in Table 4-4.

The sampling apparatus will include a probe of Teflon tubing supported in stainless-steel tubing and connected by a length of Teflon tubing to a series of impingers immersed in an ice bath. The first two impingers will contain 0.1N hydrochloric acid solution, the third will be empty and the fourth will be charged with indicating silica gel. The probe tip will be inserted into the stack to a point approximately one third of the stack diameter from the stack wall. Sample stack gas will be drawn through the sampling apparatus with a leak-free pump, connected in series to a calibrated dry gas meter and flow-metering orifice. Sample gas will be drawn at a rate of approximately 0.7 cfm for each test run.

The sample from each of the first two impingers will be recovered into a separate sample container. The sample in each container will be analyzed using a calibrated ion selective electrode to determine the ammonia concentration.

4.4.6 Benzene

Stack gas samples will be collected for benzene determinations in specially-prepared evacuated stainless-steel (SUMMA) canisters according to EPA TO-15. Each 6-liter canister will be filled to approximately 10-15 inches Hg absolute pressure with ultra-pure nitrogen or helium. The dilution gas will serve to mitigate the effects of the moisture in the sample. A short piece of new Teflon tubing will be attached to each canister via a calibrated critical orifice. This system allows sample collection without exposing the sample to pumps, flow meters, oils, etc.

Triplicate 60-minute sampling runs will be conducted on each unit during the 100% full-load operating condition (with the duct burner on) as specified in Table 4-4. Each test run will be performed at a flow rate of approximately 0.05 liters per minute at one atmosphere. After sample collection, the canister will be transported to the laboratory for gas chromatography and mass spectrometry (GC/MS) analysis within 14 calendar days. The expected detection limit is on the order of 0.5 to 2.0 ppb by volume.

4.4.7 Formaldehyde

Measurements of formaldehyde emissions will be performed according to the procedures of CARB Method 430. Triplicate 240-minute sampling runs will be conducted on one gas turbine unit during the maximum-load and minimum-load operating conditions as outlined in Table 4-3 under "toxics" tests. Each test run will be performed at a flow rate of approximately 0.39 liters per minute at one atmosphere.

Gaseous emissions will be drawn through a 1/8" o.d. Teflon sample line and two midget impingers in series, each impinger containing an aqueous acidic solution of 2,4-dinitrophenyl-hydrazine (DNPH). The samples will be sent to Air Toxics, Ltd. (ATL) in Folsom, California for analysis using reverse phase HPLC with ultraviolet (UV) absorption. Impinger contents will be analyzed separately.

The planned sample volume and sampling time have been calculated by pre-test planning calculations as described in the method. Field samples and field blanks will be taken in accordance with the method.

The DNPH sampling solution will be prepared and analyzed by ATL. Each sample will be collected within 48 hours of the last blank reagent analysis. Avogadro will collect and recover the samples, protect them from contamination, and ship them to ATL for extraction and analysis. The samples will be protected from light and kept below 4 °C at all times. The extraction will be completed within 7 days and the analysis will take place within 21 days of testing.

The results will be presented in terms of blank-corrected or non-corrected concentrations, depending on the sample-to-blank concentration ratio. Results will also be calculated and reported in comparison to the reporting limit as calculated using CARB Method 430. Complete documentation of the calculations will be provided in the final report.

4.4.8 Polycyclic Aromatic Hydrocarbons

Test Description: Measurements of the emissions of polycyclic aromatic hydrocarbons (PAH) will be performed according to the procedures of CARB Method 429. Triplicate 240-minute sampling runs will be conducted on one gas turbine unit during the maximum-load and minimum-load operating conditions as outlined in Table 4-3 under "toxics" tests. The individual target PAH compounds as specified in the ATC are listed below:

Specified PAH Compounds

Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Dibenz(a,h)anthracene
Indeno(1,2,3-cd)pyrene

Pre-test Cleaning Procedure: All glassware and Teflon sampling apparatus coming into contact with the sample (this includes the probe nozzle, probe liner, filter assembly, Teflon connecting tube, condenser, and resin cartridge) will be cleaned prior to use per the following procedures:

a. The apparatus will be soaked in a hot solution of Liquinox detergent and water;
b. Following soaking, it will be washed and rinsed with hot tap water;
c. Next, it will be rinsed with deionized water;
d. Next, it will be rinsed with acetone, hexane, and methylene chloride;
e. And finally, it will be dried in a 200 degree F oven.

All the cleaned glassware and Teflon parts will be sealed in hexane-rinsed aluminum foil. Sampling reagents will include pre-cleaned glass fiber filters and resin cartridges charged with pre-cleaned Amberlite XAD-2 resin. The filters and resin cartridges will be pre-cleaned and screened for contamination by Alta Analytical Laboratory. Pesticide-grade (Fisher Scientific *Optima* grade or equivalent) acetone, methylene chloride, and hexane reagents will be used as recovery solvents.

Sample Train Operation: The PAH sampling will be performed isokinetically with a full traverse of each stack sampling plane. Samples will be extracted from traverse points located as specified in EPA Method 1.

Pretest preparations, preliminary determinations, and leak check procedures will be those outlined in EPA Method 5. This train will be operated in the same manner as a regular EPA Method 5 sampling train. The sampling apparatus will include a heated glass probe equipped with an S-type pitot tube and thermocouple. The probe will be attached to an oven containing a heated filter holder, Teflon frit and hexane-rinsed Teflon-coated, glass-fiber filter. Both the probe exit temperature and oven will be maintained at 248°F ± 25°F during sampling. The filter holder will be connected by a length of new Teflon tubing to the impinger train containing four chilled impingers in series. The impinger train will be connected to the control box, which contained the sampling pump and calibrated dry gas meter. The temperature of the gas entering the sorbent trap will be maintained at or below 68 °F.

The first and second impingers will each contain 100 ml of a sodium carbonate / sodium bicarbonate buffer solution, the third will be empty, and the fourth impinger will contain silica gel. All of the impinger tare weights will be recorded prior to sampling.

The entire sample train will be leak tested once prior to sampling and once following testing. The pre-test leak check will be performed at a nominal vacuum (by plugging off the nozzle with new Teflon tape) to ensure that leakage does not exceed 0.02 cfm. The post-test leak check will be performed at a vacuum greater than the highest vacuum recorded during the test to ensure that leakage does not exceed the lesser of a) 4 percent of the average sampling rate, or b) 0.02 cfm. If the leak check exceeds the maximum leakage rate, the sample volume (V_m) will be corrected using the equation in Section 4.4.3.4 of the method. The sampling rate and nozzle size will be chosen to allow isokinetic sampling at 100% ±10%.

<u>Sample Recovery</u>: A single field blank sample will be also collected and analyzed according to the method. The field blank train will be prepared, charged, assembled, leak-checked, and recovered exactly like the sample trains. Avogadro will collect and recover the samples, protect them from contamination, and deliver them for analysis. The quality assurance procedures detailed in the method will be followed.

All sample fractions, except the resin cartridges, will be collected in pre-cleaned amber glass jars with Teflon-lined lids. The resin cartridges will be sealed with hexane-rinsed aluminum foil for protection from light. All sample fractions will be stored at 0-4 degrees C following sample collection. The samples will be delivered in ice chests packed with blue ice to Alta Analytical Laboratory for analysis. The chain of custody and sample log-in will be documented on suitable forms.

The XAD resin trap will be removed and capped. The filter will be removed and placed in an amber glass jar and stored on ice. The contents of the first three impingers will be returned to the original jar, weighed, the weight recorded, and the liquid level marked. The silica gel will be weighed and recorded.

The entire sampling train, prior to the XAD resin trap, including the nozzle, probe liner, the filter holder and the condenser will be rinsed three times each with acetone and methylene chloride into a glass jar. The sampling train will then be rinsed three times with hexane. Recovery of the samples and assembly of the sample trains will be conducted in an environment free from uncontrolled dust.

Sample Analysis: Analyses for polycyclic aromatic hydrocarbons will be performed by Alta Analytical Laboratory in El Dorado Hills, California. The XAD resin trap, filter and rinses will be analyzed for polycyclic aromatic hydrocarbons according to CARB Method 429. The analytical method entails the addition of internal standards in known quantities, matrix-specific extraction of the sample, preliminary fractionating and cleanup of extracts (if necessary) and analysis of the processed extract for polycyclic aromatic hydrocarbons. The analyses will be conducted using high-resolution capillary column gas chromatography coupled with high-resolution mass spectrometry (HRGC/HRMS).

Reporting: The results will be presented in terms of non-blank-corrected concentrations, depending on the sample-to-blank concentration ratio. Results will also be calculated and reported in comparison to the reporting limit. Complete documentation of the calculations will be provided in the final report.

4.4.9 Startup and Shutdown Test Procedures

Startup is defined in the ATC as "the first 180 minutes of continuous fuel flow to the gas turbine after fuel flow is initiated or the period of time from gas turbine fuel flow initiation until the gas turbine achieves two consecutive CEM data points in compliance with the emissions concentration limits of 20(b) and 20(d)" of the ATC. Shutdown is defined in the ATC as "the lesser of the 30-minute period immediately prior to the termination of fuel flow to the gas turbine or the period of time from non-compliance with any requirement listed in Conditions 20(b) through 20(d) (of the ATC) until termination of fuel flow to the gas turbine."

Triplicate gaseous emissions tests (CO, NO_X and POC) will be performed on each unit during normal startup and shutdown procedures. The POC tests will consist of operating a FID analyzer in conjunction with an on-site, direct injection GC, or with the collection of Tedlar bag samples incorporating GC/FID analysis (see Section 4.4.3). The test runs will be approximately 180 minutes in duration during each start-up period and approximately 60 minutes in duration during each shut-down period. Three start-ups and three shut-downs will be tested between the two gas turbine units.

4.4.10 Volumetric Flow Rate

Stack gas volumetric flow rates will be determined by stoichiometric calculations based on fuel flow (from the plant's certified fuel flow meters), fuel composition, and excess O_2 (%) from the flue gas (as measured by Avogadro). Calculations will be performed using an "F" factor and higher heating value for natural gas as outlined in EPA Method

19. The results will be used with the measured emission concentrations to calculate mass emission rates.

During the PM_{10} and PAH emission tests, volumetric flow rates and moisture content will be determined using EPA Methods 2 and 4 in conjunction with each test. The results will be used to calculate the percent isokinetic testing for those test runs, but not for calculation of the lb/hr emission rates.

4.4.11 <u>Fuel Analysis</u>

Calpine will provide analytical data for the fuel during each test day. The data will include the higher heating value and the EPA Fd factor. The data will be provided by Calpine's process instrumentation.

One sample from each turbine's natural gas fuel supply pipeline will be collected into a Tedlar bag each day of maximum-load testing. The samples will be submitted to ATL for analysis within 24 hours of sampling. The analysis will include fuel sulfur content by modified ASTM D-5504 during one of the test days. The results will be used in calculation of SO_2 emissions.

If a fuel sample becomes compromised in any way (i.e. leakage, air dilution, problems with the laboratory analysis), Avogadro will use the results from the opposite unit since the gas is routed from a common duct.

4.4.12 Process Data

The plant's unit operating data will be used to document process conditions during the test runs. Unit operating data will be provided by Calpine personnel. Data to be presented in the report will include a minimum of fuel flow rates (or unit heat input in MMBtu/hr) and gross power output to document load conditions. The data will also include CEMS data during the RATA runs required to calculate relative accuracy results. Avogadro will provide barometric pressure and ambient temperature data throughout the day.

4.5 ADDITIONAL INITIAL CERTIFICATION PROCEDURES

In addition to the RATA, 40 CFR, Part 75, Appendix A requires additional tests to be performed as part of the initial certification test program for the NO_X and O_2 analyzers. Testing required for the CO monitors will be performed in accordance with 40 CFR, Part 60, Appendix B, Performance Specification 4A. The tests are listed below and will be performed by Calpine according to their CEMS Monitoring Plan. The results of these tests will be included in the final CEMS certification report to be submitted by Calpine.

- Linearity Check - NO_X and O_2
- Calibration Error Test - NO_X and O_2
- Calibration Drift Test - CO
- Cycle Time Test - NO_X and O_2
- Response Time Test - CO

SECTION 5.0

QUALITY ASSURANCE AND REPORTING

5.1 SAMPLING AND ANALYTICAL QA/QC

Avogadro has instituted a rigorous QA/QC program for all of its air pollution testing. The program ensures that the emission data reported are as accurate as possible. The procedures included in the cited reference methods will be followed for all steps of preparation, sampling, calibration, and analysis. Avogadro will be responsible for preparation, calibration and cleaning of the sampling apparatus. Avogadro will also conduct the sampling and sample recovery, storage and shipping.

Contract laboratories will conduct some of the preparation and sample analyses. The laboratories we have chosen are established leaders in development and performance of the reference methods for which they have been selected. Their credentials for adherence to the required quality assurance procedures are well known.

5.2 QUALITY CONTROL REQUIREMENTS

Our Quality Assurance Program Summary, located in Appendix B, provides our equipment maintenance and calibration schedule, quality control acceptance limits, and any corrective action that may be needed. For additional quality control, Avogadro will follow the procedures outlined below:

- Preliminary stack flow and temperature measurements will be taken to assure correct isokinetic sampling.
- All field equipment will undergo a visual inspection prior to testing and will include pre-test calibration checks.
- In addition to the normal cleaning methods, all metals sample train glassware will be cleaned in Citranox® acidic cleaning solution.
- Glassware will be visually inspected prior to testing.
- All reagents will be made fresh daily. A new reagent blank will be retained for every new stock of reagent.
- Only "trace" grade reagents will be used in this test program. The Certificate of Lot Analyses for chemicals and sample containers used in this program will be included in the final report.

5.3 QUALITY ASSURANCE AUDITS

Quality assurance audits will be conducted as part of the test program to ensure that the final results are calculated from the highest quality data. The individual audits are listed below:

- The dry gas meters used for the outlet sampling locations will be calibrated using a critical orifice (with a known calibration factor) before the commencement of the testing program. The meters will then be checked immediately following the program. The meter values must agree within ±5 percent of the orifice value. If the meters do not pass, the results will have to be evaluated as to their accuracy.
- The S-type pitot tubes used during the test program will be calibrated using a wind tunnel and standard pitot tube. The S-type pitots will again be checked following the test program and must be within ±3 percent of the pre-test value.
- All thermocouples (TCs) used during the test program will be calibrated using three standards (ice water, boiling water, and boiling oil). The TCs will again be checked following the test program and must be within ±1.5 percent of the calibrated range.

5.4 DATA REDUCTION PROCEDURES

The raw data collected during the sampling and analysis procedures will be used to calculate the results of the testing program. The analysis or reduction of the data to the final results will follow these steps, where appropriate to the test method:

1. Check field-sampling data for accuracy and calculate appropriate data averages (e.g., temperatures, pressures, volumes, etc.).
2. Double-check calculation of the data averages.
3. Review in-house and contract laboratory reports and ensure that appropriate and/or required QA/QC steps were followed.
4. Input field and laboratory data to established, verified computer spreadsheets for calculation of volumetric flow rates, mass emission rates or other appropriate results.
5. To verify results, perform example calculations by hand on a single test run for each emission result reported.
6. Compile summary tables of results and review all inputs.

The report will include copies of spreadsheet printouts (data input and results output) and example calculation checks. The field data sheets with average data calculations will also be included. All values found to be below the detection limit of the analytical method will be reported as "less than" ("<") the full detection limit value.

5.5 REPORT FORMAT

Avogadro will prepare a series of reports, each to present the test data, calculations, descriptions and results. The reports will include:

- Emission compliance tests
- Startup and Shutdown emission tests
- CEMS RATA
- Ammonia emission factors

Each report will include a series of the appendices to present copies of the field data sheets, equipment calibration data, and example calculations. Avogadro uses computer spreadsheets to calculate results from field data sheets and laboratory results. One run of every method performed is also hand calculated. The hand calculations are checked against the spreadsheet results and included in the example calculation appendix of the final report. Avogadro understands the "Standard Condition(s)" that are to be used in the BAAQMD are 29.92 inches of mercury and 70 °F.

Each report will be divided into various sections describing the different aspects of the source-testing program. Table 5-1 presents a typical Table of Contents to be followed during preparation of each final report. Prior to release by Avogadro, each report will be reviewed and certified by the project manager and either his supervisor or a peer. The report will be issued within 30 days after completion of the field-testing.

TABLE 5-1
TYPICAL REPORT FORMAT
CALPINE

Title Page
Certification of Report
Executive Summary
Table of Contents

Section

1.0 Introduction and Summary (includes summary tables of average results)
2.0 Source Location Information
 2.1 Facility Description
 2.2 Sampling Location
 2.3 Unit Operating Conditions
3.0 Program Description
 3.1 Test Program Objectives
 3.2 Test Contractor and Key Personnel
 3.3 Laboratory Contractors and Analyses
 3.4 Test Program Calculations
 3.5 Program Test Schedule
4.0 Test Procedures
 4.1 Method Summaries for Criteria Pollutants
 4.2 Method Summaries for Air Toxic Contaminants
 4.3 Ancillary Teats
5.0 Quality Assurance and Reporting
6.0 Discussion of Results (includes summary tables of individual results)

Appendices

A Standard Measurement Procedures
B Quality Assurance Program
 B.1 Program Summary
 B.2 ARB Certifications
 B.3 Equipment Calibrations
C Process Data
D Field Data Sheets
E Laboratory Reports
F Emission Calculations
G Chain of Custody Forms

5.6 AVERAGE RESULT SUMMARY

Table 5-2 presents the typical tabular format that will be used to summarize the results in the final source test report. Separate tables will outline the results for each target analyte and compare them to their respective emissions limits.

TABLE 5-2
TYPICAL RESULT SUMMARY
CALPINE
TEST CONDITION
SPECIES

Test No.:	1-XX	2-XX	3-XX	Average
Date:	X	X	X	--
Time:	X	X	X	--
Flue Gas:				
O_2, % volume dry	X	X	X	X
CO_2, % volume dry	X	X	X	X
Flue gas temperature °F	X	X	X	X
Moisture content, % volume	X	X	X	X
Volumetric flow rate, dscfm	X	X	X	X
Species:				
ppm volume dry	X	X	X	X
ppm @ 15% O_2	X	X	X	X
lb/hr	X	X	X	X
tons/yr	X	X	X	X
lb/MMBtu	X	X	X	X

SECTION 6.0

PLANT ENTRY AND SAFETY

6.1 SAFETY RESPONSIBILITIES

The SVP plant safety coordinator is responsible for ensuring routine compliance with plant entry, health, and safety requirements. The SVP plant manager has the authority to impose or waive facility restrictions. The Avogadro project manager (Kevin Crosby) has the authority to negotiate any deviations from the facility restrictions with the SVP plant site safety coordinator and/or plant manager.

6.2 SAFETY PROGRAM

Avogadro has a comprehensive health and safety program that satisfies State and Federal OSHA requirements. The program includes an Illness and Injury Prevention Program, site-specific safety meetings and training in safety awareness and procedures. The basic elements include: (1) written policies and procedures; (2) routine training of employees and supervisors; (3) medical monitoring when necessary, (4) use of personal protection equipment; (5) hazard communication; (6) pre-test safety meetings; and (7) routine surveillance of on-going test work.

Avogadro will provide all safety-related equipment to its employees. The equipment will include hard hats, safety shoes, safety glasses or goggles, hearing protection and hand protection.

6.3 SAFETY REQUIREMENTS

All test personnel will adhere to the following standard safety measures:

- Attend safety indoctrination session upon initial arrival at the plant and complete the safety checklist.
- Confine selves to the testing and administration areas only.
- Wear hard hats at all times on-site where designated.
- Wear protective shoes or boots in test area.
- Wear protective glasses with side shields or goggles in designated areas.
- Use full body harnesses and follow B&V tie off standards.
- Know the location of first aid equipment and fire extinguishers.
- Refrain from smoking